Index

Achievement, 54,76–77, 81, 102, 104, 106, 118, 139, 144, 152–53, 155, 157, 159, 167, 223, 238
Activities, 5, 58–59, 65, 67, 82, 89, 112, 120, 213–14, 217, 219
Algorithm. *See also* Procedure
  13–15, 26, 27, 31, 35–38, 48, 78, 97, 185, 195, 198
  construction of, 14–15, 26, 30
Application, 28, 57, 77, 118, 188–89, 193, 206, 209, 212, 215, 226–27, 231
Assessment. *See also* Evaluation
  6–7, 108–17, 118–29, 152, 162, 197–98, 231, 243
  definition of, 108, 118–20
  elements of, 110–11, 120
  formal, 119–20
  informal, 110, 119–20, 198
  self, 123, 203
  types of, 108–9, 115–16, 118–22, 125, 127–29, 231
  use of, 116–20, 128
  validity, 128
Attitude, 16, 20, 60, 77, 84, 106, 118, 121, 144, 239

Belief, 1, 7, 18, 20, 128, 145, 147, 169, 171–72, 183, 187, 239
  about mathematics, 20, 116, 174–82, 233

Calculation. *See* Computation
Calculators, 37, 48, 74, 88, 109, 203, 208, 238
  access to, 35, 113, 140
  graphing, 205–11, 213–15, 217
  scaling, 113, 215–17, 221
Cognitive processes, 7, 32, 34, 36, 38–39, 154, 191
Communication, 12, 16–17, 32, 45, 52, 56, 61, 81, 85–86, 89, 92, 111, 119, 123, 160–61, 164, 170, 202, 223, 243–44
  mathematical, 8, 45, 52, 60, 69, 88, 111, 155–56, 163, 181
  through assessment, 118–20, 128
  with minority students, 140
  with parents, 61, 119, 139, 172, 244
  with policy makers, 139, 244
Computation, 31, 35, 74, 111, 184, 201, 203, 206, 224, 226
  mental, 15, 74, 184
Computers, 88, 106, 109, 195, 201, 205–6, 214, 223–28, 238
  access to, 35, 140, 209
  based curriculum, 194–204
  graphing, 201, 209, 217–18, 220–22, 226
  lab, 197, 200–202, 213–14
  spreadsheet, 224, 226
Concept, 8, 9, 15, 42, 65, 68, 74, 80, 110, 160, 162–63, 189, 193–94, 199, 204, 218, 226–27
  construction of, 14, 23
  fraction, 70, 73
  function, 194
  mathematical, 13, 45–46, 108, 111, 154, 160, 205, 212–13, 215, 222, 240
  number, 22–25
  self, 41–42, 54
Concrete materials. *See* Manipulatives
Constructivism, 7, 12, 14, 22–30
Context, 32, 84, 119, 127, 183–93, 199, 223–24, 226–27
  mathematical, 116, 223, 226
  real-life, 29, 187
  social, 45
Cooperative learning. *See* Group; Learning
Culture, 154–57, 161–62, 166–73
Curriculum, 44, 52, 60, 89, 140–41, 154, 156, 167, 175, 180–81, 183, 192, 194–95, 206, 208, 212, 223, 227, 230, 238–39, 241, 243
  computer based, 194–204
  decisions about, 31, 38, 140
  development of, 89, 140, 194
  problem-solving, 197–98, 203

Demographics, 130–32, 135–36, 141

Errors, 3, 7, 14, 18, 60, 85, 91, 93, 97, 119, 122–23, 127, 178, 184, 195, 215, 218, 221, 240

Index

Achievement, 54,76–77, 81, 102, 104, 106, 118, 139, 144, 152–53, 155, 157, 159, 167, 223, 238
Activities, 5, 58–59, 65, 67, 82, 89, 112, 120, 213–14, 217, 219
Algorithm. *See also* Procedure
  13–15, 26, 27, 31, 35–38, 48, 78, 97, 185, 195, 198
  construction of, 14–15, 26, 30
Application, 28, 57, 77, 118, 188–89, 193, 206, 209, 212, 215, 226–27, 231
Assessment. *See also* Evaluation
  6–7, 108–17, 118–29, 152, 162, 197–98, 231, 243
  definition of, 108, 118–20
  elements of, 110–11, 120
  formal, 119–20
  informal, 110, 119–20, 198
  self, 123, 203
  types of, 108–9, 115–16, 118–22, 125, 127–29, 231
  use of, 116–20, 128
  validity, 128
Attitude, 16, 20, 60, 77, 84, 106, 118, 121, 144, 239

Belief, 1, 7, 18, 20, 128, 145, 147, 169, 171–72, 183, 187, 239
  about mathematics, 20, 116, 174–82, 233

Calculation. *See* Computation
Calculators, 37, 48, 74, 88, 109, 203, 208, 238
  access to, 35, 113, 140
  graphing, 205–11, 213–15, 217
  scaling, 113, 215–17, 221
Cognitive processes, 7, 32, 34, 36, 38–39, 154, 191
Communication, 12, 16–17, 32, 45, 52, 56, 61, 81, 85–86, 89, 92, 111, 119, 123, 160–61, 164, 170, 202, 223, 243–44
  mathematical, 8, 45, 52, 60, 69, 88, 111, 155–56, 163, 181
  through assessment, 118–20, 128
  with minority students, 140
  with parents, 61, 119, 139, 172, 244
  with policy makers, 139, 244
Computation, 31, 35, 74, 111, 184, 201, 203, 206, 224, 226
  mental, 15, 74, 184
Computers, 88, 106, 109, 195, 201, 205–6, 214, 223–28, 238
  access to, 35, 140, 209
  based curriculum, 194–204
  graphing, 201, 209, 217–18, 220–22, 226
  lab, 197, 200–202, 213–14
  spreadsheet, 224, 226
Concept, 8, 9, 15, 42, 65, 68, 74, 80, 110, 160, 162–63, 189, 193–94, 199, 204, 218, 226–27
  construction of, 14, 23
  fraction, 70, 73
  function, 194
  mathematical, 13, 45–46, 108, 111, 154, 160, 205, 212–13, 215, 222, 240
  number, 22–25
  self, 41–42, 54
Concrete materials. *See* Manipulatives
Constructivism, 7, 12, 14, 22–30
Context, 32, 84, 119, 127, 183–93, 199, 223–24, 226–27
  mathematical, 116, 223, 226
  real-life, 29, 187
  social, 45
Cooperative learning. *See* Group; Learning
Culture, 154–57, 161–62, 166–73
Curriculum, 44, 52, 60, 89, 140–41, 154, 156, 167, 175, 180–81, 183, 192, 194–95, 206, 208, 212, 223, 227, 230, 238–39, 241, 243
  computer based, 194–204
  decisions about, 31, 38, 140
  development of, 89, 140, 194
  problem-solving, 197–98, 203

Demographics, 130–32, 135–36, 141

Errors, 3, 7, 14, 18, 60, 85, 91, 93, 97, 119, 122–23, 127, 178, 184, 195, 215, 218, 221, 240

Evaluation. *See also* Assessment
7, 18, 55, 57, 93, 106, 156, 193, 241
objectives for, 198
self, 57, 180

Feedback, 29, 77–79, 97, 102, 106, 108, 110, 116, 128, 132, 155, 203, 234

Games, 28–29, 53, 67–68, 86, 106
Gender, 60, 144–50, 166
Goals, 9, 14, 26, 31, 37, 46–49, 65–66, 68, 76–77, 80, 86, 92–93, 101–2, 104–7, 109, 115, 118–19, 122–23, 128, 145, 150, 157, 172, 181, 195, 204, 226–27, 242
Group, 53, 81, 91, 192, 207, 211, 231
cooperative, 52–61, 62, 65, 104, 155, 160, 172, 231
process, 54, 56, 197, 203
small, 15–16, 18–19, 27, 52–61, 65–66, 70, 113, 125, 155, 160, 164, 197
social, 166, 171

Insight, 3, 43, 48, 179, 214, 235
Instruction, 4, 6, 13–16, 19, 55, 62–68, 109, 116–17, 119–20, 128, 131, 144–48, 150, 155, 157, 161, 165, 167, 169, 176, 181, 205–6, 212, 223, 227, 240
effective, 63, 68, 76–81, 240
planning for, 2, 62–63, 68, 76–77, 80, 240
review, 65–67, 76–78, 81, 162
small group. *See* Group
types of, 52–61, 62–67, 155, 167–78, 201, 211, 213–15, 226
traditional, 27–28, 60, 76, 226
Interaction, 53, 56, 95, 149, 161, 169, 171, 243
social, 8, 12–20, 29
student-student, 4, 12, 15, 19–20, 56, 65
teacher-student, 12, 15, 20, 60, 108, 149, 169, 172

Knowledge, 3–5, 8, 14, 22–23, 39, 43, 104, 108–16, 119, 124, 154, 167–68, 172, 203, 209, 213, 238, 240, 242
construction of, 13, 90, 103
mathematical, 13, 23–27, 29–30, 35, 39, 44, 51, 111, 161, 180, 189, 211
social, 8, 23–24, 27

Language, 69–75, 159–65
Learning, 1–4, 9, 12–13, 16, 19, 32, 34, 42, 45, 49, 52–53, 62–63, 70, 90, 101–3, 106–7, 119, 150, 159, 160, 168, 177, 179, 192, 203–5, 212, 218, 220, 222–23, 226–28, 230–31, 238–41
cooperative, 52–61, 62, 65, 104, 155–56, 160, 202
difficulties, 177, 181
environment, 51, 87, 172, 222, 231–32
self-directed, 202–4
Literacy, 131, 138–39, 162

Manipulatives, 32, 52, 63, 66, 70, 84, 103, 140, 155, 162, 167, 231
Mathematics
anxiety, 53, 91, 149–50, 174, 177
language, 45, 60, 69, 160
Meaning, 8, 14–18, 20, 32–35, 37–39, 70, 101, 105, 108, 110, 160, 163, 168, 172, 179, 181, 185, 188, 190, 192
Metacognition, 7
monitoring skills, 4, 123
Minorities, 132, 134–36, 138–41, 150, 155, 165, 194
education of, 132, 134, 138–41, 159–65
Misconception. *See* Errors
Model (ing), 76, 86–87, 101, 103–4, 109, 113, 119, 188, 191, 195, 199, 201, 212, 221, 239, 241
for in-service, 233–35
mathematical, 52, 197–99, 201, 209, 211, 231, 238
Motivation, 20, 28, 62, 67, 101–4, 107, 128

Objectives. *See* Goals

Perception. *See* Belief
Piagetian task, 22–23
Practice. *See also* Skill
2, 9, 14, 31, 34–35, 38–39, 52, 57, 61, 67, 76, 80–81, 93, 178, 220
teaching, 1–2, 8–9, 229–33, 235–36, 240
Problem, 4–6, 8, 13, 16, 20, 46–48, 51, 53, 56, 180, 183–86, 205, 211
posing, 4, 6, 52, 54–55, 82–91, 105, 180, 199
real-life, 28, 109, 187, 197, 199, 216, 222
Problem solving, 2, 4–7, 12–13, 16, 19–20, 28, 31, 52, 81, 84, 104, 108–9, 111–12, 118, 127, 148, 163, 175, 178, 191, 193–98, 201, 203–6, 216, 222, 224, 227, 231, 239
computer-based, 195–201, 203
cooperative, 8, 15, 18, 195, 197, 202
strategies, 53, 76, 80, 103–4
Procedure. *See also* Algorithm
3, 9, 13, 30–31, 34–39, 53, 80, 99, 108, 110–11, 184–85, 204, 224, 227
routine, 31–32, 34–35, 38–39

Reasoning, 44, 51–52, 108, 111, 115, 185, 190, 232, 235
Reflection, 36, 38–39, 47, 56, 78, 81, 145, 175, 180, 203–4, 230–31, 234, 237, 240
Representation, 32–33, 38, 89, 103, 109, 155, 188–91, 195, 198–99, 201, 203, 212, 215, 218–23
Research, 1–9, 69–70, 76, 93, 103, 130–31, 138–41, 147–48, 153–56, 160, 166–72, 174–77, 179, 185, 189, 193, 223, 234, 237

Skill. *See also* Practice
4–6, 8, 65, 81, 111, 119, 121, 128, 131, 154, 159–60, 167–68, 172, 191, 198, 201, 220, 226, 239, 243
teaching, 60, 122, 230
Standard
NCTM, 8, 9, 12, 52–53, 69, 75, 88, 118, 129, 139–40, 144, 146, 148, 156–57, 160, 163, 181, 183, 196, 198, 205–6, 212, 229, 243
norm, 12, 20, 55, 106, 118, 168, 239
Strategies. *See* Problem solving; Teaching
Student
role of, 20, 194, 201–5, 212

Teacher
responsibility of, 16, 18, 42–45, 84, 119, 128, 237–40, 242
role of, 18, 20, 26–27, 42, 55–56, 60, 62, 65, 90, 169, 194–205, 207, 227–29, 237–40, 242
Teaching, 1–2, 8–9, 30, 42, 45, 50–51, 62, 128, 145, 154, 156, 159, 179, 181, 183, 193, 204–5, 212–23, 226–32, 238–42
effective, 68, 76, 78, 108, 238
strategies, 62, 119, 159, 181, 213, 227, 231, 242
Testing, 118–19, 127, 129, 152–53, 177, 179, 184–85, 193, 198, 203, 206, 239

Understanding, 6, 12, 14, 20, 32, 34, 38, 42, 44–45, 62, 70, 73, 76, 78–80, 90, 102, 116, 122–24, 150, 159–60, 163, 209, 213, 231

Writing, 26, 67, 69–70, 71–74, 92–100, 180
student journals, 67, 94, 105, 124